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Professional Development That Supports the Teaching of Cognitive Reading Strategy Instruction

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Abstract

In this article, we describe and report on the results of a study in Texas that tested 2 models of professional development for classroom teachers as a way of improving their practices and increasing the reading achievement of their students. To meet this goal, 44 participating teachers in grades 2–8 learned to teach their students cognitive reading strategies through 1 of 2 models of professional development. One group attended a traditional 2-day summer in-service; the second attended the workshop and received classroom-based support from a reading coach. Using a random-effects, multilevel, pretest-posttest comparison group design and a multilevel modeling analytic strategy, we determined the effects of these 2 models. The full intervention group (teachers who were coached) outperformed the partial intervention group (workshop only) in all the teacher observation and student achievement measures. This study demonstrates the potential of coaching as a viable model of the professional development of reading teachers.

Reading is essential in our society. Those who struggle with literacy face severe academic perils early in life and economic inequity later. In a country where reading and writing guide social equity, it is imperative that all children become proficient in their ability to read and are given opportunities to engage in higher-level thinking. Unfortunately, not all children have this opportunity. Results from the National Assessment of Educational Progress (NAEP) indicate that while the reading achievement of fourth and eighth graders has continued to rise since 1971, the gap in performance scores between white and Asian/Pacific Islander students and their African American, Hispanic, and Native American peers continues to exist

(Lee, Grigg, & Donahue, 2007). Students who attend inner-city schools scored significantly lower than students who attended schools on the fringes of urban areas or in rural areas (National Center for Educational Statistics [NCES], 2003). Clearly, some students are not receiving the quality of reading education that will close the gaps in achievement; that is, teachers are not providing instructional opportunities for their students to become more strategic readers (Sailors & Henderson, 2008).

Major studies provide strong evidence that students can be taught to be strategic readers (Brown, Pressley, Van Meter, & Schuder, 1996; Duffy et al., 1986, 1987; Pressley & Wharton-McDonald, 1997); unfortunately, there is little evidence to show that teachers are actually teaching comprehension (Pressley, 2002; Pressley, Wharton-McDonald, Mistretta-Hampston, & Echevarria, 1998). The fact is, teachers can improve their instructional comprehension practices and teach their children to be more strategic in their reading (Duffy, 1993a). However, the lingering question is how to best help teachers improve their instructional comprehension practices so that their students can become strategic readers (National Institute of Child Health and Human Development [NICHD], 2000; Sailors, 2008; Snow, 2002).

The aim of this federally funded, quasi-experimental study was to test two models of professional development for elementary and middle school teachers—both models aiming to improve the instructional comprehension practices of teachers and to raise the reading achievement of students. One model was based on a traditional 2-day workshop; the second model was based on the same workshop complimented by classroom-based coaching support.

Background

The Importance of Cognitive Strategy Instruction

The importance of strategies and strategy instruction has been well documented (Paris, Waskik, & Turner, 1991; Pressley, 2000). Reading is a complex, strategic process that requires both cognitive and metacognitive strategies (Block & Pressley, 2002; Dole, Duffy, Roehler, & Pearson, 1991; NICHD, 2000; Paris, Lipson, & Wixson, 1983; Pearson & Dole, 1987). Research has examined the strategic moves of proficient readers who employ a set of cognitive reading strategies while actively engaged in meaning making (Dole, Nokes, & Drits, 2008, p. 348). Whether we refer to these acts as skills or strategies is a highly contested debate. For the purposes of this article, we will refer to these "deliberate, goal-directed attempts to control and modify the reader's efforts to decode texts, understand words, and construct meaning of text" as strategies (Afflerbach, Pearson, & Paris, 2008, p. 368), recognizing that the goal is to help children automatically use these strategies, and thus turn them into a reading skill (p. 371). These self-selected actions require that readers have metacognitive awareness, which enables them to apply, discuss, and evaluate strategic actions, especially when reading tasks are difficult (Paris et al., 1983).

Paris et al. (1983) contend that strategic readers possess three different kinds of metacognitive knowledge, including knowing which strategies to use (declarative), knowing how to use these strategies (procedural), and knowing when and why to use the strategies (conditional). Strategic readers monitor their word identification and comprehension and are motivated to solve reading difficulties. They have a collection of strategies at their disposal and can analyze reading tasks to determine appropriate strategies to use (Pressley, Borkowski, & Schneider, 1989). Reading strategies include word-recognition strategies, comprehension strategies, and fix-up strategies (Almasi, 2003).

Major studies provide strong evidence that reading strategies can be taught (Brown et al., 1996; Duffy et al., 1986, 1987; Pressley & Wharton-McDonald, 1997) and that students can learn sets of strategies simultaneously (Reutzel, Smith, & Fawson,

2005). Although research has demonstrated the importance of teaching the various strategies to children, evidence is lacking regarding how best to support teachers in learning to teach critical cognitive strategies (NICHD, 2000).

Theoretical Frame: The Professional Development of Teachers

While the field of research on teaching is still relatively young, there have been great strides made in what is known about the professional development of teachers (Borko, 2004, p. 3). First, there is little evidence that the typical "one shot" models of professional development have any lasting effects on gains made by students (Cochran-Smith & Lytle, 1999). Second, teachers report that they find these workshops boring and irrelevant, that they forget 90% of what was presented to them, and that they want more and better in-service support (Miller, 1998). Third, research has demonstrated that it is the quality of professional development that impacts teacher knowledge, beliefs, and practices (Anders, Hoffman, & Duffy, 2000; Duffy, 2004; Richardson, 1996). More specifically, studies have shown that the professional development of reading teachers is a long-term process that requires careful monitoring and intensive follow-up support (Duffy, 1993a, 1993b).

Syntheses of research on the professional development of reading teachers describe a set of features that may be effective in improving practices (Anders et al., 2000; Darling-Hammond, 2000; Hoffman & Pearson, 2000; NICHD, 2000; Snow, Burns & Griffin, 1998). First, teachers must volunteer to participate, have a choice in the content of the professional development, and be personally invested in learning and implementing the new practice. Second, there must be intensive levels of support with sustained effort for the teachers. Third, this support must come in the context of their practice and must be monitored by a knowledgeable other. Fourth, teachers need opportunities and tools to reflect on their own practices systematically as they move toward change. Fifth, teachers must have opportunities to engage in conversations and discussions as they improve their practices. Finally, teachers must be part of a larger process of professional development, one that is inclusive of university-based researchers, school-based teacher educators, and other teachers. As helpful as this work has been in thinking about the professional development of classroom reading teachers, none of this work focused on models that improved comprehension instruction.

States, districts, and schools have recently moved toward the coaching of reading teachers as a model of professional development (Dole, 2004). Coaching is espoused by professional organizations (International Reading Association [IRA], 2006), and aspects of coaching have found its way into the literature, including the roles and responsibilities (Dole, 2004; Roller, 2006), characteristics (Shanklin, 2006), and qualifications of literacy coaches (IRA, 2004, 2006) as well as various models of literacy coaching (Bean, 2004; Toll, 2005; Vogt & Shearer, 2006; Walpole & McKenna, 2004). Theories of adult and higher education are driving this literature, and a plethora of texts on literacy coaching have emerged over the past few years.

Literacy coaching has been described as "hot" in recent international reports (Cassidy & Cassidy, 2008) and has been shown to have a positive impact on the craft (Zwart, Wubbels, Bolhuis, & Bergen, 2008) and domain knowledge of teachers (Brady et al., 2009). Research reports indicate that literacy coaching has an impact on teacher efficacy (Cantrell & Hughes, 2008) and improved practices in the areas of special education (Gersten, Morvant, & Brengelman, 1995), writing instruction (Frey & Kelly, 2002), and preservice science teacher education (Scantlebury, Gallo-Fox, & Wassell, 2008). However, there is little empirical evidence that demonstrates coaching improves the practices of reading teachers, with even less evidence in

the area of comprehension instruction (Sailors, 2008).

Recent studies that have attempted to tie coaching to student reading achievement yielded mixed results. For example, Van Keer and Verhaeghe (2005) compared a year-round intensive coaching model (35 hours of professional development contact hours) to a more restrictive model (15 hours) for second- and fifth-grade teachers. Measuring only student outcomes, the team found that both treatments were equally effective in changing students' reading comprehension, fluency, strategy use, and self-efficacy.

In a more recent study, Lovette and colleagues (2008) implemented a coaching model to prepare high school teachers to teach students with reading disabilities. In their longitudinal study, the authors worked with 23 teachers, teaching them to develop metacognitive models of literacy instruction, to become more reflective about their teaching practices, and to master effective multiple-component approaches to reading interventions (Lovette et al., 2008, p. 1085). Observations, feedback, modeling, and support were integral components of this intervention. Teachers provided high positive ratings regarding the usefulness of the training and attributed to the training an increased sense of efficacy in improving student outcomes and understanding reading problems. Student outcome data indicated that classrooms in which teachers had an extra year of coaching demonstrated greater gains. Results suggested that the program and teacher training affected student outcome in positive ways. The study did not investigate changes in teacher practices.

Based on our review of the extant literature, the following points establish a need for this study. First, the results across studies that examined the effects of coaching as a model of professional development on student outcomes are mixed. Second, to our knowledge, no studies have examined both changes in teacher practices and student achievement with coaching as an intervention. Third, there is a scarcity of research that examines the role of coaching in improving teacher practices in the field of reading instruction, especially comprehension instruction. Therefore, we sought to examine two models of professional development for classroom teachers: one based on a traditional 2-day workshop and a second that provided teachers with classroom-based coaching support in addition to a traditional workshop. Both models focused on improving the instructional reading practices of teachers as a way of teaching students to become more strategic in their reading.

Research Questions

The present study provides results from the first year of a 2-year project that explored the effectiveness of two models of professional development on the instructional comprehension practices of elementary and middle school teachers and the reading achievement of their students. The primary goal of this exploratory study was to determine if classroom-based professional development (coaching) proved to be a more effective model of professional development than a traditional model of professional development as measured by changes in student reading achievement over time. The study design and analytic approach allowed us to answer the following questions related to both teacher and student effects: (1) Does an intensive model of coaching lead to an increased use of intentional comprehension instruction on the part of teachers? (2) Does the increased use of intentional comprehension instruction by teachers lead to increased reading achievement of students from low-income backgrounds? and (3) Are there aspects of improvement in instructional comprehension practices positively associated with increased student achievement, and which aspects can be attributed to the coaching model? We developed the following hypotheses: (1) Teachers participating in an intensive model of coaching would exhibit an increase in the use of intentional comprehen-

sion instruction in their classrooms. (2) The increased use of intentional comprehension instruction by teachers would lead to an increase in reading achievement of students of low-income backgrounds. (3) The relationship between the frequencies of use of selected instructional comprehension practices by teachers would be positively associated with students' performance on the measures of comprehension achievement.

Method

Prior to testing hypothesis 1, we conducted a *t*-test analysis of mean differences at pretest between study groups in the use of instructional strategies. The pretest analysis revealed no significant differences between study groups; therefore hypothesis 1 was tested using a *t*-test analysis of means at posttest only. To test hypothesis 2, a random-effects, multilevel, pretest-posttest comparison group design was employed (Raudenbush & Bryk, 2002). This analytic approach provided a framework to test the two models of professional development, both focusing on improving comprehension instruction. Correlation analyses were used to test hypothesis 3. Two groups of teachers participated in this study. The first, the partial intervention group, attended a 2-day workshop only, and the second, the full intervention group, attended the same 2-day workshop and received additional classroom-based coaching support. The results reported here are from the first year while the study was still in Phase I (Borko, 2004).

Participants

The participants in this study were drawn from three school districts that served low-income communities located in metropolitan areas in central and southern Texas. In order to identify the participants, the first author visited each district and presented the study at the monthly principals' meeting prior to the onset of the study. Fourteen of the 39 principals voiced an interest and invited us to their campuses to present the study at their faculty meetings that same month. Because schools are social places and teachers interact closely with each other during the school day, a phenomenon known as experimental treatment diffusion presented a threat to the internal validity of the investigation (Cook & Campbell, 1979). In order to avoid this phenomenon, we randomly assigned campuses to a group prior to the campus visit.

The first author attended faculty meetings at these 14 campuses and invited teachers to participate. In 13 schools, between 2 and 8 teachers volunteered. In the fourteenth school, 16 teachers expressed an interest in participating and we randomly selected 8 participants. We had no first-grade teachers volunteer for this study, and we were unclear as to why this was. One of the teachers dropped out of the study in October due to medical reasons, leaving us with only 44 participating teachers. All teachers received an honorarium of $150 for their participation in the study. Table 1 provides the demographic information of the school districts, schools, and number of participating teachers from each district. Our participants included teachers from the second ($n = 6$), third ($n = 3$), fourth ($n = 6$), fifth ($n = 5$), sixth ($n = 3$), seventh ($n = 11$), and eighth ($n = 8$) grades. These teachers represented a variety of subjects. Many were regular education teachers who taught across the subject areas (37%), while other taught departmentalized reading (21%), social studies (20%), English/language arts (13%), and science (9%) classes. Because our intervention was focused on the improvement of instructional comprehension practices of teachers in regular education classrooms, we did not include district-designated special education or self-contained bilingual classrooms as part of this study, although many of the students in the study were learning English as a second language.

Additionally, the years of experience of these participating teachers varied from

TABLE 1. Demographic Information on Districts, Students, Schools, and Number of Participating Teachers

District	Students on Federal Lunch Program (%)	Hispanic Students (%)	African American Students (%)	School	Students on Federal Lunch Program (%)	Students Limited English Proficient (%)	Classification Level	Number of Teachers in Study	Study Group
1	74.2	14.7	71.0	A	76.32	60	Elementary	6	Full
				B	66.67	14	Elementary	2	Partial
				C	77.97	11	Elementary	6	Full
				D	71.43	14	Elementary	1	Partial
				E	73.91	9	Middle	3	Partial
2	87.9	.4	95.1	F	97.10	34	Elementary	4	Partial
				G	94.23	24	Elementary	4	Partial
				H	93.18	10	Middle	8	Full
3	53.3	26.2	53.3	I	76.00	6	Middle	7	Full
				J	57.30	4	Middle	2	Partial
				K	48.50	2	Middle	1	Partial

a first-year teacher to a 35-year veteran (mean of 9.9; *SD* of 7.53). Fifty-nine percent of the participating teachers had been awarded a bachelor's degree; the other 41% had completed at least some graduate-level coursework. Ninety-one percent of the teachers in this study had earned their accreditation from a traditional certification program; 9% had completed an alternative certification program. There were no statistical differences between the groups regarding years of experience, level of educational attainment, or type of certification. Finally, of the three participating districts, only one was making a concerted effort to instruct teachers in how to teach comprehension strategies to their students. District 2 was in the process of training all special education teachers in the methods of the Read 180 program. None of our participating teachers had been trained in this program at the time of this study. Likewise, none of our participating teachers received any other classroom-based support during this study.

We invited all students in the self-contained classrooms to participate; we randomly selected one class of the departmentalized teachers and invited students in that class to participate. Teachers sent parental consent forms home with all their students; unfortunately (and with no known explanation), only 543 students ($N = 543$) enrolled in the 44 individual teachers' classrooms returned signed parental consent forms and signed their own assent forms. During the course of the study, 16 students dropped out for personal reasons unrelated to the study, resulting in a final student-level sample of 527 students ($N = 200$, full treatment; $N = 327$, partial treatment). The average number of students we assessed in the full-treatment classrooms was 11.76 ($SD = 3.53$). In classrooms receiving partial treatment, we assessed an average of 12.11 ($SD = 5.95$) students. The participating students reflect the demographics of the larger school population. Additionally, there were no students who were in more than one teacher's classroom during the course of this study.

Description of the Intervention

The study was designed to explore the effectiveness of two models of professional development focused on the instructional comprehension practices of classroom teachers who taught in low-income schools and the reading achievement of their students. In this section, we describe the professional development's content and the two professional development models used to deliver that content.

Content of professional development. Borrowing from other studies that have been successful in improving instructional

reading practices (Brown et al., 1996; Duffy, 1993a, 1993b; Duffy et al., 1986, 1987; Richardson, 1996), the research team taught participating teachers how to teach cognitive reading strategies (Dole et al., 2008, p. 348), specifically, how to engage in intentional comprehension instruction.

Intentional comprehension instruction is the practice of (*a*) offering children opportunities to engage in cognitive reading strategies (Taylor, Pearson, Clark, & Walpole, 2000) and (*b*) explaining the subroutines, or secrets (Duffy, 2003), involved in those cognitive reading strategies in ways that are determined and constructed jointly by teachers and students (Anderson, 1992; Brown et al., 1996). These secrets are uncovered through teachers modeling and explaining their thinking processes, providing scaffolded assistance, and helping the students apply the strategy elsewhere. These secrets are also uncovered through opportunities for students to verbalize their cognitive processing as a way of co-constructing understandings of those strategies (Pressley et al., 1992). Because reading comprehension is complex and comprehension instruction "cannot be routinized" (NICHD, 2000, p. 4–125), teachers must be metacognitively aware of their own use of strategies, able to explicate them, and able to modify and adapt their practices in order to make instructional decisions based on the needs of their students (Duffy, 1998; Hoffman & Duffy, 1999). So while teachers were provided with sample explanations throughout the professional development experience, they were encouraged to construct their own explanations with their students (Brown et al., 1996).

Delivery of the content: The interventions. The two intervention models (workshop only and workshop complimented by classroom-based support) began with the attendance of all teachers at a 2-day summer workshop. Teachers had been assigned to groups prior to the workshops, although they were not told of their assignment until after the workshop. University reading faculty designed and implemented the workshop at each of the two geographical locations. Because there are too many cognitive reading strategies to learn in a 2-day period, we chose to engage the teachers with one cognitive reading strategy, inferencing, and to explore it deeply. The professional development team taught teachers how to (*a*) identify places in text where they made an inference in order to understand the text, (*b*) identify how they knew to make an inference, (*c*) identify when it is appropriate to use inferencing, (*d*) identify why they make inferences, (*e*) explain the subroutines involved in making an inference, and (*f*) create spaces in which conversations about inferences (and the underlying subroutines) could take place during reading. Although these workshops were held at the district headquarters and were devoid of students, they were based on structural and core features of effective professional development workshops for teachers (Garet, Porter, Desimone, Birman, & Yoon, 2001; National Center for Educational Statistics [NCES], 1999). The workshops were held prior to our first data-collection time period.

While all teachers attended the 2-day workshop, the teachers in the full-intervention group also received classroom-based coaching support—each was assigned one of two instructional reading coaches. Both coaches were highly qualified as per the guidelines of the International Reading Association (2004, 2006). One coach, the first author of this investigation, possesses a doctoral degree in curriculum and instruction with an emphasis in language and literacy studies, taught graduate and undergraduate reading education courses at the university level, and is a licensed reading specialist. The other possesses a master's degree in education, served for 23 years as a reading specialist, and taught undergraduate reading education courses at the university level. The coaches held 15 years of combined classroom teaching experience and 10 years of classroom-based professional development experience between them.

Each coach supported approximately half of the teachers in this study.

The coaches provided demonstration lessons in classrooms, co-taught with teachers, provided reflective feedback based on lessons they observed, and facilitated conversations that explored cognitive reading strategies. We saw these interactions as a progression toward active learning by an individualized learning for the teachers. Throughout the study, the teachers selected which cognitive reading strategy would be the focus of their interaction with their coach; the coaches asked the teachers to select based on the needs of the teachers' students (reading strategies their students were not able to perform) or their own needs (reading strategies that they were struggling to teach).

Fidelity of Implementation

We collected data to ensure that the coaches were implementing the innovation in similar ways and the degree to which the coaches implemented the most critical components of the intervention (Mowbray, Holter, Teague, & Bybee, 2003). Members of the data-collection team used the teacher observation protocol (described below) on two lessons delivered by each of the coaches—one at the beginning and one midway through the study. University reading faculty used the data to determine if the coaches were using intentional comprehension instruction during the observed demonstration lessons. University reading faculty also monitored the coaching reports every month to ensure that the coaches were (*a*) visiting the teachers; (*b*) allowing teachers to select the focus cognitive reading strategy of the interaction; (*c*) engaging the teachers in multiple ways (demonstration lessons, co-teaching, and guided conversations); and (*d*) moving teachers toward independence (reflective feedback). The coaches met as a team every 2 weeks to discuss their interactions with the teachers.

The analysis of the coaching reports indicated that the coaches visited each teacher an average of 329 minutes during the year. Sixty-two percent of the recorded interactions between coaches and teachers were classroom based and involved some interaction between the coach, the teacher, and at least some of the students in the classroom; the remaining interactions (38%) involved guided conversations. Classroom-based interactions included demonstration lessons (50%), co-teaching interactions (25%), and reflective feedback from the coach (25%). A vast majority of the interactions focused on cognitive reading strategies (98%), while 2% focused on fix-up strategies. No interactions focused on word identification strategies. Through these analyses the team determined that the coaches were engaging the teachers in ways that met the criteria of the study, which allowed us to feel confident that the integrity of the intervention had been maintained (O'Donnell, 2008).

Data Collection Measures and Procedures

In order to examine the research questions and test the associated hypotheses, the research team collected a variety of data including teacher observation and student reading achievement data. This section provides a description of the measures used and procedures employed for collecting and analyzing the data.

Group Reading Assessment and Diagnostic Evaluation (GRADE). We used the GRADE to collect reading achievement data. This group-administered, norm-referenced, and standardized reading achievement assessment (American Guidance Services [AGS], 2001) is designed for use with participants ranging from prekindergarten through twelfth grade. The GRADE was selected because of the quality of its psychometric properties and its availability for each grade level requisite to this study. It was also selected because it is a measure of reading comprehension, including listening, sentence, and passage comprehension. Evidence of ade-

quate score reliability (coefficient $\alpha = .89$) and validity evidence met recommended criteria (American Educational Research Association/American Psychological Association/National Council on Measurement in Education [AERA/APA/NCME], 1999). Standardized Growth Scale Values (GSVs) on the GRADE were used to measure change (i.e., increase or decrease at posttest, using pretest as a covariate) regarding students' level of reading comprehension. GSVs were used because these composite scores (i.e., a total test score) provide a measure of a student's reading achievement in reference to the entire range of achievement across all grades. Graduate student members of the research team administered the GRADE at the beginning (September) and end (May) of this study.

Comprehension Instruction Observation Protocol System (CIOPS). Data that would measure the implementation of the content of the professional development were collected using the CIOPS (Sailors, 2006), and electronic category observation instrument (Martin, 1977) specifically designed for the gathering of data in this study. The CIOPS is an observational protocol targeted to the teaching of cognitive reading strategies (in the presence of a text-based lesson) across the areas of reading, science, and social studies and the instructional interactions that surround those engagements. The CIOPS is a combination of observational note-taking and a quantitative coding process following the work of Herbert and Attridge (1975).

Based on recommendations by DeVellis (2003) and Nunnally and Bernstein (1978), the instrument underwent several rounds of development, redevelopment, and field testing. First, the research team completed an exhaustive search of the literature on reading and reading instruction by searching for a comprehensive list of cognitive reading strategies and instructional interactions between teachers and students. A list of the strategies and assigned operational definitions was compiled for each. The cognitive reading skills and strategies that were identified are shown in Figure 1, and the instructional interactions are shown in Figure 2.[1] The instrument was validated across various times and settings for the purposes of construct development (AERA/APA/NCME, 1999; Hintze, 2005; Volpe & McConaughy, 2005); this development included input from classroom teachers, field testing across elementary and middle school classrooms, and ongoing interactions with the reading faculty at the university. Through this process we developed an exhaustive set of cognitive reading strategies and classroom instructional interactions.

Graduate students enrolled in the master's reading program and adjunct reading faculty served as data collectors for this study (all either had or were seeking a reading specialization and all were former classroom teachers). A project-employed research coordinator scheduled both the spring and fall observations in each classroom, and teachers were asked to schedule observations during a lesson in which reading in connected text was a significant part of the lesson. During the two data-collection time periods (early September and late May), observers took continuous observational field notes during the 45-minute visits, recording a narrative account of what was occurring in the classroom. These descriptive field notes focused on the context of the classroom, materials used, text-based comprehension and/or comprehension strategy instruction, and the instructional strategies employed by the teachers. After the classroom visit, but within a 24-hour period, the observer transferred the narrative notes into the CIOPS system. Data collection and coaching visits were never conducted during the same week.

In order to reduce the inference required of the observers during the coding process (Herbert & Attridge, 1975), the narrative data were reduced to the smallest possible reasonable and recognizable units as they were coded (Martin, 1977). In de-

Activating and Accessing Prior Knowledge	Asking, Answering, and Reformulating Clarification Questions
Classifying and Categorizing	Connecting
Critical Literacy: Authenticity / Generalizability / Perspective / Purpose of Author	Determining Main Idea / Theme
Finding, Extracting, and Paraphrasing Important Details	Inferencing
Integrating External Text Features	Monitoring
Predicting / Confirming / Repredicting	Previewing
Recalling	Responding Aesthetically
Setting a Purpose	Skimming and Scanning
Summarizing	Synthesizing
Test Taking Strategies	Using Fix-Up strategies
Visualizing	Word Identification and Word Recognition

FIG. 1.—Cognitive reading strategies

signing the instrument, we selected units to be coded based on the cognitive reading strategies that we identified in our review of the literature. The data collectors identified and marked those instances in the lesson in which the teacher provided an opportunity to engage the students in discussion around a cognitive reading strategy as a unit; if there was no evidence of such opportunities, the collector marked "no strategy." In the case of an opportunity to engage, the data collector then marked the instructional interactions between the teacher and the students in the class. As the cognitive reading strategy under discussion changed, so did the coding. That is, the data collectors marked units as the instruction of the teachers (and the focus of their instruction) changed. Pre-implementation data were collected just after the summer

Assessed the strategy
Engaged in defining the strategy
Engaged in demonstrating the strategy
Engaged in explaining the process
Engaged in modeling when to use the strategy
Engaged in modeling why to use the strategy
Engaged in naming the strategy
Engaged in providing other examples
Engaged in practice with the strategy
Engaged in questioning techniques
Engaged in reminding of use of strategy
Engaged in telling when to use the strategy
Engaged in telling why to use the strategy

FIG. 2.—Instructional interactions during observed strategy instruction.

workshop during a 2-week period (early September) and prior to the beginning of coaching. Post-implementation data were collected during a 2-week period of data collection (late May) of the same academic year.[2] Teachers in the study did not have access to the system or the data collected. All observers were blind to the condition of the teachers they observed. Furthermore, coaching activities and data collection never took place on the same day, and data collectors were rotated across classrooms to prevent identification of the teachers' treatment conditions.

Although the observations were low inference, intensive training and monitoring in the use of the teacher observation data were necessary to obtain reliable results. Observers were trained for 2 full days in a university-based classroom environment in which they were introduced to the theoretical framework of the study and the use of the instrument. Training took place using an electronic training module (a manual, a practice video, and various examples of video clips of teachers engaged in teaching cognitive reading strategies). Observers practiced identifying and coding the lessons' various aspects. On the third day, observers were placed in nonstudy classrooms (in nonstudy schools) with the trainer. To evaluate interrater reliability, data points were compared between each pair of points of agreement between the observer and trainer (i.e., labeling of the cognitive reading strategy and type of interaction between teacher and students). In the morning, the first observer was placed in a classroom with the trainer, marking data independent of each other; point-by-point agreement using Cohen's kappa statistic revealed an interrater reliability of .80. Later that same morning, the second observer was placed in a different nonstudy classroom with the trainer and the pair collected and marked data independent of each other; point-by-point agreement using Cohen's kappa statistic revealed an interrater reliability of .81. Results of the interrater reliability analyses using the kappa coefficient were acceptable in both instances, with an estimate of $r \geq .80$ (Fleiss, 1981). Throughout data collection, 10% of the lessons were checked for ongoing interrater reliability, with results remaining above a kappa of .80.

Coaching reports. After each interaction with a participating teacher, coaches compiled a report; these data were descriptive in nature. Each coach report included information on the date of the interaction, the amount of time spent with the teacher, the nature of the interaction (demonstration lesson, co-teaching, reflective feedback, or guided conversations), and the comprehension strategy that was the focus of the interaction. Additionally, the coaches submitted a brief set of notes that provided a narrative for the interaction.

Data Analysis

Prior to answering our research questions and testing our hypotheses, we screened the data for missing and/or extreme values by examining the distributional patterns of the acquired observational data. Additionally, we examined the data to ensure that all assumptions required for using the general linear model (i.e., linearity, normality, homoscedasticity, and independence of observations) were tenable within each classroom, school, and the total sample. To increase the sensitivity of the analyses, we examined these data characteristics and model assumptions at every hierarchical level of our analyses.

After data screening, we used a multilevel modeling analytic strategy that allowed us to examine the fixed and random variation in student change as measured by GSVs on the GRADE within and between full intervention and partial intervention classrooms (students nested within classrooms) and full and partial intervention classrooms nested within schools. The respective teacher's group and the classroom in which individual students were natu-

rally nested or clustered constituted the fixed-effects portion of our model within the hierarchical design. Student-level data on the GRADE were allowed to randomly vary across time (i.e., from pretest to posttest for both groups) using an autoregressive level 1 covariance structure allowing us to model the dependence (i.e., the correlated structure) among student-level scores nested within individual classrooms across time. In our analysis, we used the Hierarchical Linear Modeling (HLM) computer program, version 6.0 (Raudenbush, Bryk, Cheong, Congdon, & DuToit, 2004). The method of restricted maximum likelihood (REML) was used for the estimation of all parameters in the HLM model.

Next, we examined the effect of treatment on teachers' use of intentional comprehension instruction expressed as the average or mean number of times teachers were observed to implement the instructional strategies. At pretest, the study groups were not observed to be statistically different on the average number of times they implemented the target instructional strategies. Therefore, we conducted a posttest analysis using an independent samples *t*-test using the average or mean number of times teachers were observed implementing the target instructional strategies as the outcome (dependent) variable. In some instances (e.g., when the independent and/or the dependent variables were on an ordinal or interval level) linear regression was the analytic method used due to the level of measurement of the data and the question posed.

Results

In this section, we describe our results related to our exploratory research questions. To answer the first research question (Does an intensive model of coaching lead to an increased use of intentional comprehension instruction on the part of teachers?), we examined both the opportunities to engage students in cognitive reading strategies that teachers offered and the constructed explanations around those strategies. We created two composite variables, both drawing from raw frequency counts of the CIOPS data (observed events as nominal yes/no for each of the strategies and interactional explanations). To capture the occurrence of cognitive reading strategies, we used Almasi's (2003, p. 12) organizational structure and summed all raw variables together except for the word identification/word recognition, fix-up, and test-taking strategies. We called this composite variable "opportunities to engage in comprehension strategies." Reliability analysis (i.e., internal consistency) provided adequacy for the internal consistency of the opportunity-to-engage variable ($\alpha = .78$).

The second composite variable allowed us to examine the constructed explanations around cognitive reading strategies. We called this composite variable "constructed explanations" based on the nature of its components. We used the work of Duffy, Paris, and their colleagues (Duffy et al., 1986, 1987; Paris et al., 1983) to create this variable, taking into account the types of knowledge readers have (declarative, procedural, and conditional) around strategic reading and how teachers might engage students in discussions around those strategies (the "what," the "how to use," and the "when" and "why" of the strategies) (Paris et al., 1983). This composite variable, therefore, consisted of all of the raw variables except assessing comprehension, questioning, and reminding. We based the linear composite variable on the frequencies of teachers either exhibiting these practices or not. Reliability analysis using nonparametric correlational statistics provided marginal adequacy ($\alpha = .79$) for the internal consistency structure of this composite variable.

Table 2 illustrates the average number of times that all teachers in each group were observed implementing intentional comprehension practices at pretest and posttest as measured with our two composite variables. There were no statistically sig-

TABLE 2. Pretest and Posttest Mean Teacher Observation Scores and Standard Deviations as a Function of Targeted Strategy Study Group

	Pretest			Posttest			
Cognitive Strategy	*M*	*SD*	*t*(42)	*M*	*SD*	*t*(42)	*d*
Opportunity to engage			.49				.78
Full intervention ($n = 17$)	6.05	3.00		7.35	4.42		
Partial intervention ($n = 27$)	5.29	3.85		4.00	4.28	2.44*	
Constructed explanations			.52				.64
Full intervention ($n = 17$)	1.88	1.53		4.35	2.95		
Partial intervention ($n = 27$)	1.58	1.41		2.70	2.23	2.31	

NOTE.—n = teacher count in study group. Cell values represent the average number of times teachers in their respective study group were observed to use the strategy. Cohen's d is the effect size defined as the difference between posttest means in standard deviation units (small $< .30$; medium = .31–.60; large $\geq .61$).

*$p < .05$.

nificant differences between groups at pretest for either of these composite variables; therefore we conducted a between-study-groups posttest analysis of the means.

For our first composite variable, opportunities to engage in cognitive reading strategies, we detected a statistically significant difference ($p < .05$) favoring the full intervention group. On average, at the posttest time period, full intervention teachers offered 1.65 more opportunities to engage in intentional comprehension instruction during class than did partial intervention teachers. The magnitude of the effect size was large (Cohen's $d = .64$). Interested readers are referred to Cohen (1988) for further information regarding the range and recommended interpretation of effect sizes (small = .10 to .34; medium = .35 to .60; large $\geq .60$). We found similar patterns with our second composite variable, constructed explanations. There were statistically significant differences ($p < .05$) in the direction of the full intervention group for this composite variable. On average, at the posttest time period, full intervention teachers offered 3.35 more opportunities to engage in cognitive reading strategies during class than did partial intervention teachers. We observed a large effect for this analysis (Cohen's $d = .78$) according to Cohen (1988).

Within our full intervention group, we were interested to see if there was any one particular group of teachers who either provided more opportunities for their students to engage in cognitive reading strategies or offered more constructed explanations of those strategies. To answer these questions, we used the four separate chi-square tests to examine the differences in implementation when considering the categorical variables of years of experience, levels of education, and subjects and grade levels taught by the teachers in the coached group. There were no statistically significant results for either of our composite variables.

To answer the second research question (Does the increased use of intentional comprehension instruction lead to increased reading achievement of students from low-income backgrounds?), we used a multilevel, random-effects pretest-posttest analysis of student-level scores on the GRADE. Student scores within treatment group classrooms on the GRADE were not statistically different at pretest. However, to increase the sensitivity of our analysis, we followed recommendations from Tabachnick and Fidell (2007) and Raudenbush and Bryk (2002) by modeling study group, time, and the study group by time interaction as fixed components and allowing student scores to vary randomly over time from pretest to posttest. First, we examined the main effect of the intervention between the two groups (full and partial) on the achievement scores

TABLE 3. Pretest and Posttest Mean Growth Value Scores and Standard Deviations as a Function of Study Group

Source	Pretest			Posttest			Effect Size (Posttest—Between Groups) *d*
	M	*SD*	*n*	*M*	*SD*	*n*	
Full intervention	436.50	39.61	179	448.46	34.95	179	
Partial intervention	433.40	39.20	265	437.19	33.82	265	.33

NOTE.—Effect size, Cohen's *d*, is calculated between treatment groups at posttest. Grand mean across all time points was 438.89.

of students on the GRADE at posttest. The fixed-effects portion of our multilevel analysis revealed an average partial treatment group posttest score on the GRADE of $M = 437.19$ ($SD = 33.82$). At posttest, students in the full intervention group scored on average 11.27 points higher than students in the partial intervention group. Table 3 provides the means and standard deviations for students in each respective study group. Table 4 provides the results of the multilevel fixed and random-effects analysis.

In the random-effects portion of our multilevel analysis, we tested the magnitude and impact of the variability that occurred by allowing the intercepts and slopes to vary for students nested within teachers' classrooms (by full versus partial). Residual variance of the intercept in the random portion of the model was significant at $p < .001$, and random residual component of the slope variance for individual students over time was significant at $p < .05$. Results from the random portion of this model provided evidence that greater variability in reading achievement was explained by the analysis for students in the full intervention group. Importantly, we observed a statistically significant effect ($p < .001$) when allowing this random variability between groups. In this way, we identified important significant random variability between groups over time. This effect would have gone undetected without the use of a multilevel/hierarchical modeling approach.

Because of the unbalanced structure of the numbers of students nested within grade level classrooms, we conducted a one-way analysis of variance (ANOVA) separated by treatment groups to determine if any significant differences existed on GRADE scores

TABLE 4. Multilevel Effects of Professional Development Model on Student Reading Achievement

Effect	Parameter	*SE*
Fixed effects:		
Intercept (average score—partial treatment group)	437.19***	2.31
Group (treatment)	11.27**	3.85
Time (average change in time slope)	−3.79*	1.66
Group × time (interaction of study group × time component)	−8.17**	2.69
Level #1 (i.e., student-level) random effects:		
Intercept residual variance	521.14***	103.98
Student level (slope variance)	59.94	89.46

NOTE.—At posttest, students in the treatment group scored an average of 11.27 points higher than students in the partial intervention group. Residual variance of the intercept in the random portion of the model was significant at $p < .001$; random residual (i.e., slope/change) variance for individual students over time was not significant.

*$p < .05$.
**$p < .01$.
***$p < .001$.

across grade levels. We conducted the ANOVA *F*-test at an alpha level of .05, corrected for type I error inflation using the Bonferonni correction, and we found no statistically significant results across the range of grade levels for either group.

Correlation analyses used to answer the third research question (Are there aspects of improvement in instructional comprehension practices positively associated with increased student achievement, and which aspects can be attributed to the coaching model?) revealed that as the frequency of opportunities to engage (the opportunity variable) increased, the change in GRADE score also positively changed. In fact, 71% of the students whose teachers displayed characteristics specific to the composition of the comprehension strategies variable resulted in positive GRADE score changes. The effect size for this trend was large (Cramer's $V = .86$).

Similarly, we investigated the relationship between the composite variables. For these analyses we used linear regression. Our descriptive analysis indicated that 37% of the teachers provided students with opportunities to engage in cognitive reading strategies between zero and two times per observation, with the other 63% providing at least three or more opportunities to engage per observation. The practical effect size for this analysis was medium (Cramer's $V = .75$). Using linear regression, the opportunity-to-engage variable was observed to be a statistically significant predictor of the constructed-explanations variable ($F(1, 25) = 7.99$, $p < .001$), and the regression equation yielded an adjusted R^2 of .24.

The next sets of analyses explored the quantity of the interventions (measured by the number of minutes coaches spent engaged with the participating teachers) on the implementation of these practices by teachers in the study. We used linear regression to explore the opportunities with which teachers provided their students to engage in cognitive reading strategies and the role of the coaches' visits (as measured through time). Our results indicated that there were no statistically significant differences between groups. However, when we explored the use of constructed explanations and the role of the coaches' visits (as measured through time), we observed significant differences in the direction of the full intervention group ($F(1, 25) = 7.74$, $p < .05$). Based on a linear regression analysis, the results yielded an effect size of .24, thereby explaining 24% of the variability related to the outcome/influence in a teacher's use of intentional instructional practices.

The next sets of analyses explored the quality of the intervention, as described through the types of interactions that the coaches had with the participating teachers. Due to the nature of these data (i.e., counts of events), we used a chi-square analysis for this exploration. While there were no statistically significant results observed for the variables regarding the influence of each in explaining or predicting a teacher's engagement in constructed explanations, we observed very large practical effects for all of them (as measured through contingency coefficients [*CC*]): demonstration lessons (*CC*) = .77; co-teaching (*CC*) = .81; reflective feedback (*CC*) = .82; guided conferences (*CC*) = .84; teacher-initiated interactions (*CC*) = .87; and coach-initiated interactions (*CC*) = .82. The contingency coefficient is a measure of association based on chi-square distribution and is appropriate when the analysis of nominal (categorical) variables have more than two discrete categories (i.e., the table categories exceed 2×2). Similar to other measures of effect size and association, values range between 0 and 1, with 0 indicating no association between the row and column variables and values closer to 1 indicating a high degree of association between the variables (Grissom & Kim, 2005).

Discussion and Implications

The purpose of this study was to test two models of professional development for

classroom teachers in helping them to improve their instructional comprehension practices and in raising the reading achievement of their students. One model was based on a traditional 2-day workshop, while the other was more intensive and based on literacy coaches working in classrooms with teachers after they had attended the workshop. In this section, we discuss our results and then move to a broader discussion of how this study has the potential to inform research on the professional development of classroom reading teachers, especially those who engage in comprehension instruction.

Our analyses indicated that both groups of teachers implemented (to varying degrees) the content of the workshop. These results are aligned with the results of other studies that demonstrate that teachers teach the focus of their professional development (Desimone, Porter, Garet, Yoon, & Birman, 2002). The model of coaching that we employed in this study seemed to be equally successful, regardless of years of experience, subject taught, level of education, and/or the grade level the teachers in this study taught. While other studies have taught a specific content to teachers at one or more grade levels and then measured outcomes on their practices (see, e.g., Birman, Desimone, Porter, & Garet, 2000; Desimone et al., 2002; Garet et al., 2001; Porter, Garet, Desimone, & Birman, 2003), we are unaware of any studies that have focused on comprehension instruction and professional development of teachers as we did in the study under investigation in this article. That is to say, coaching may be a model of professional development that can be supportive of teachers in grades 2 through 8 across reading, language arts, science, and social studies.

The results of this study suggest that classroom-based coaching might support teachers in the implementation of cognitive reading strategies across an academic school year, something that is difficult for teachers to learn to do and that takes time (Duffy, 1993a, 1993b). However, our findings come with a caveat. While we might like to point to the practice of coaching and conclude that it was responsible for the changes in practice and outcomes, our design does not allow us to do so. Future research would allow the causal study of coaching as a mechanism for professional development. Such a study would require random assignment of the teacher to one of the three groups: a traditional control, a workshop only, and a coached group (or other innovative model of professional development) in order to establish a true causal relationship between coaching and improvement in teacher practices. And, although it appears that traditional workshops have received notoriety within the literature, perhaps it is the nature of the workshops that also must be explored, as our data seem to suggest that our participating teachers were able to implement (to some degree) what they learned in the 2-day workshop.

Also noteworthy are our findings related to aspects of improvements in practices and student achievement. Our results indicated that students in classrooms in which teachers offered more opportunities to engage in comprehension strategies were associated with positive changes in their reading achievement scores, and the more opportunities the teachers offered to their students, the more they also seemed to engage in constructed explanations around those strategies. These findings are aligned with the practices of accomplished teachers (i.e., teachers with consistently high gain scores on measures of reading achievement in low-income schools) (Knapp, 1995; Langer, 2000; Metsala et al., 1997; Morrow, Tracey, Woo, & Pressley, 1999; Pressley, Rankin, & Yokoi, 1996; Taylor et al., 2000). Converging evidence from these studies seems to suggest that accomplished teachers provide instructional opportunities for their students to engage in ongoing comprehension activities. We believe that our study suggests that teachers should not only provide students with opportunities to engage in cognitive reading strategies but also con-

struct explanations around those strategies with their students.

Our interest in understanding the value of coaching as part of professional development was noteworthy because of the lack of empirical evidence to support it (Sailors, 2008) and because of the pervasiveness of coaching in public schools (Dole, 2004). Our results indicated that while duration (professional development over time) did make a difference in informing the instructional reading practices of teachers (both opportunities and constructed explanations), contact time with coaches made a difference only in helping teachers engage in constructed explanations to students. While our results seem to align with the professional development literature of science and math teachers—that the duration of the professional development and contact hours do make a perceived difference in helping teachers implement innovative practices (Garet et al., 2001)—a speculation (and a caveat) is in order. These results may suggest a relative ease of teaching teachers to recognize opportunities to engage students in cognitive reading strategies (recognizing an opportunity to engage, knowing when comprehension should occur, and being able to at least name the strategy used to understand), which may be indicative of beginning metacognition on the part of the teacher. This may be easier for teachers to learn than how to explain their procedural knowledge, or even to remember to engage students in constructed explanations around those strategies. More studies that investigate the role of knowledge of the teacher's growing metacognition while engaged in professional development are warranted.

Finally, the implication of our work centers on the qualities of interactions that took place between the coaches and teachers. Our descriptive data indicated that half of the interactions in the classroom were demonstration lessons. We believe this was because the demonstration lessons were what teachers may have expected the coaches to do and because they were comfortable places for teachers and coaches to establish a relationship. While our findings suggested large practical effects in the types of interactions between mentors and teachers, we do not have conclusive evidence that would point to any one component of the model in explaining changes in teacher practices; the role of these components might be investigated in future studies. Although earlier research demonstrated the importance of each of the individual components to teacher practices, Kucan (2007) successfully used transcript analysis with teachers, and Costa and Garmston's (2002) work has guided reflective conversations with teachers for years. Still, the design of our study and the implementation of the intervention confounded our ability for further testing of these variables. It may have been because these interactions were tied to activities that were embedded inside purposeful and meaningful learning experiences for teachers and were guided by a knowledgeable other and may be inextricably linked to each other in ways that cannot be pulled apart without careful investigations (Putnam & Borko, 2000), or it may be because these components simply need to be implemented (and tested) separate from each other. Regardless, more research is needed around the specific role of these interactional components with teachers in future studies.

While our study demonstrates that coaching may be a viable model of professional development for classroom reading teachers, there are limitations to our work. First, the teachers who participated in this study were volunteers. Previous studies have demonstrated that teachers who volunteer tend to adopt instructional practices more easily than those who do not (Borko, Davinroy, Bliem, & Cumbo, 2000; Garet et al., 2001). We also recognize that teachers may have volunteered for the study because of the stipend we offered them. Unfortunately, the design of this study does not allow us to account for the teachers'

overriding motivations for participating and the subsequent role of that motivation in improving their practices.

Our study was based on a small sample size, and the unique context in which our study took place limits the generalizability of our results (Campbell & Stanley, 1963). Our study was conducted within the social context of two large metropolitan areas in Texas where the nature of high-stakes testing presents challenges to research studies such as the one described in this article. Parents (and students) may have opted out of the assessment in this study because of the sheer amount of testing that already takes place in these schools. Teachers may have been willing to engage in innovative practices with us because they thought it would benefit their students on the test. Finally, external coaches delivered the model rather than school-based support systems and, although other studies of external coaches have been found to be effective (Brady et al., 2009), the model (and ensuing results) may very well look different under different contexts (school-based coaches, for example). Likewise, a more nuanced look at the way the treatments affected various students' ability levels might yield interesting findings. For example, were the treatments equally effective for students who struggle with learning to read compared to students who read above grade level? And how might this study look different with students in other demographic (cultural, linguistic, and socioeconomic) settings?

The data we collected in this study may have also limited the results such as the two 45-minute observations in each teacher's classroom; however, the decision to collect only two rounds of data was guided by our resources. While we do not believe that teachers were able to "load up" on cognitive strategies that they taught, we do recognize that there is considerable variability within teachers' reading lessons (Croninger & Valli, 2009). More than two observations in each classroom might have yielded even deeper understanding of the implementation of the practices we measured. Similarly, a more nuanced look at the use of strategies by the students in this study would have enhanced its findings. We were limited by resources and consequently were not able to collect data that would indicate the level of use of cognitive reading strategies by students as a result of the intervention.

Likewise, there were many qualitative features of the professional development that we did not consider in this study. A more nuanced look at the role of coconstruction of knowledge and beliefs between the coaches and the teachers and how that influenced the practices of the participating teachers might yield interesting findings. Additionally, a critical analysis of the relationships between the coaches and teachers, including the ways in which trust was established and maintained and the communication norms that enabled critical dialogue, might also yield interesting findings. All are important for future studies.

Conclusion: Common Sense or Common Practice

Common sense dictates that classroom-based professional development might assist teachers in improving their practices; however, the practice is more common than the research to support it. Mandates that have placed teacher education at the forefront of policy with little description of what quality teacher education looks like and the most helpful way to deliver the content of the professional development (Lipson, Mosenthal, Mekkelsen, & Russ, 2004) can only be supported through research that demonstrates that coaching is a viable model of professional development. Considering our results, this study has the potential to "evoke images of the possible . . . not only documenting that it can be done, but also laying out at least one detailed example of how it was organized,

developed, and pursued" (Shulman, 1983, p. 495).

While we do believe that this study and its results have implications for research in reading and reading teacher education, it was exploratory and therefore does not imply a cause-and-effect relationship. Future research that attempts to fill in the still-remaining gaps will provide more answers to the complex questions associated with coaching, practices of teachers, and outcomes of students. Because billions of dollars are spent every year on the improvement of teaching and learning, ongoing explorations of coaching are important, regardless of cost and difficulty. The effects of coaching on teaching and learning warrant the attention of the research and policy communities.

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1. The operational definitions of both can be found in the technical manual of the instrument and are available upon request.

2. Sample lessons that were coded appear in the technical manual and are available upon request.

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